

NON-PUBLIC?: N
ACCESSION #: 9506140436
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Brunswick Steam Electric Plant, Unit 1 PAGE: 1 OF 7

DOCKET NUMBER: 05000325

TITLE: Manual Reactor Protection System Trip (Scram) Due To
Decreasing Condenser Vacuum
EVENT DATE: 05/19/95 LER #: 95-11-00 REPORT DATE: 06/09/95

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 01 POWER LEVEL: 27

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Steve F. Tabor, Regulatory Affairs
Specialist TELEPHONE: (910) 457-2178

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPO
ENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On May 19, 1995, during the startup of Unit 1 following refuel outage B110R1, a manual Reactor Protection System trip (scram) was initiated at 1806 hours due to decreasing condenser vacuum. Prior to the scram, multiple trips of the Unit 1 Circulating Water Intake Pumps (CWIPs) occurred due to high differential pressure across the circulating water traveling screens. The high differential pressure was caused by aquatic plant life which clogged the fine mesh screens installed on the inservice CWIP traveling screens during low tide. Following the shutdown, reactor vessel water level decreased below the low level 1 setpoint (162.5") resulting in Primary Containment Isolation System Groups 2 (Drywell Floor and Equipment Drains) and 6 (Containment Atmospheric Control) valve isolations. Additionally, an isolation signal to the normally closed Group 8 (Residual Heat Removal Shutdown Cooling) isolation valves was

received.

To maintain reactor pressure and control the vessel cooldown rate the main steam line drain and isolation valves were closed. On May 20, 1995, at 1136 hours, following restoration of the Unit 1 Circulating Water system, reactor startup was commenced. This event had minimal safety significance in that the systems required to shutdown the plant responded as required. Corrective actions include the establishment of a task force to investigate and implement methods to prevent or mitigate biological impingement of the CWIP traveling screens. The cause of this event per NUREG 1022 criteria is C, External Cause.

END OF ABSTRACT

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TITLE

Manual Reactor Protection System Trip (Scram) Due To Decreasing Condenser Vacuum

INITIAL CONDITIONS

On May 19, 1995, Unit 1 reactor startup and power ascension was in progress. Unit 1 reactor power was approximately 27% with the turbine off-line. Emergency Core Cooling Systems were operable. The 1B, 1C, and 1D Circulating Water Intake Pumps (CWIPs) were in operation with 1A in standby. Each pump had fine mesh screens installed on their associated circulating water traveling screens. At 1740 hours, high differential pressure annunciators were received for the three in-service CWIPS.

EVENT NARRATIVE

On May 19, 1995, between 1744 and 1746 hours, the 1B, 1C, and 1D CWIPs tripped on high differential pressure and initiated the events listed in the attached sequence of events. Efforts to restart the CWIPs were unsuccessful. Due to the loss of circulating water, condenser vacuum decreased, causing condensate temperatures to increase and flashing in the condenser hotwell. This caused condensate and feedwater flow to decrease, resulting in decreased reactor water level.

Due to the low power level and the slow rate of vacuum lowering, efforts were directed to clean the traveling screens and restart the pumps. It was also decided that if these activities could not be implemented before condenser vacuum lowered to 16 inches that a reactor scram would be manually inserted. As condenser vacuum approached 16 inches, the

direction was given to insert a reactor scram. The low reactor water level alarm annunciated as preparations were being made to manually scram the reactor. At 1806 hours, a manual scram was initiated. All control rods inserted as required.

Following the reactor shutdown, reactor water level decreased below the low level 1 setpoint (162.5 "). The minimum reactor water level reached during the event was approximately 137". As designed the low level 1 signal resulted in the isolation of the Primary Containment Isolation System (PCIS) Groups 2 (Drywell Floor and Equipment Drains) and 6 (Containment Atmospheric Control) isolation valves and in the receipt of an isolation signal to the normally closed Group 8 (Shutdown Cooling) isolation valves.

The Reactor Core Isolation Cooling (RCIC) system was manually started and initially operated in the automatic mode to control reactor water level until the condensate and feedwater systems could be aligned for injection. RCIC experienced oscillations in the automatic mode and consequently RCIC operation was transferred to the manual mode where the system responded as expected. Due to a combination of low vessel steam loading and RCIC injection, reactor vessel water level increased above the RCIC system high water level trip setpoint resulting in a RCIC turbine trip shortly after transfer of the system to the manual mode of operation. The highest reactor water level reached during the event was approximately 212 inches. Following the RCIC system trip, level control was established with condensate and feedwater through the startup level control valve.

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Reactor pressure decreased due to the inservice steam loads and low decay heat. Operations personnel verified pressure/temperature relationships and established actions to assure a 100 degree/hour cooldown rate would not be exceeded, including closing the Main Steam Isolation Valves and controlling pressure using the main steam line drains. Reactor level was restored to normal, the affected safety system isolation and actuation signals were reset, and the emergency operating procedures were exited.

On May 20, 1995, at 1136 hours, following restoration of the circulating water system, Unit 1 startup commenced. On May 21, 1995, at 2214 hours, the Unit I turbine generator was synchronized to the off-site electrical grid system.

CAUSE OF EVENT

Aquatic plant life (gracilaria) impinged on the fine mesh screens

installed on the inservice CWIP traveling screens resulted in a high differential pressure trip of the affected CWIPs during low tide. The loss of CWIPS resulted in decreasing condenser vacuum and the subsequent manual reactor shutdown.

Environmental conditions at the time of the event were conducive to plant material movement in the intake canal. Exaggerated high and low tides had been experienced for most of the week preceding the event. The day of the event tornado watch alerts had been declared. on the day of the event a storm occurred with heavy rains and changes in wind direction. Observations of gracilaria in the fish flumes and in the stationary parts of the traveling screen frame support the conclusion that the impinging material was gracilaria.

A digital flow controller was installed on the Unit 1 RCIC system during the B110R1 refuel outage conducted in April/May of 1995. During the power ascension phase of startup, tuning of the controller was conducted with the system operating in the test mode. Investigation into the event determined that the RCIC control system tuning methodology was inadequate for ensuring proper operation of the system in the automatic mode.

CORRECTIVE ACTIONS

The Unit 1 and 2 CWIP traveling screens were cleaned and monitored to ensure continued operation.

A Standing Instruction was issued to increase operations sensitivity to those precursors to conditions which could result in CWIP traveling screens high differential pressure.

Accelerated inspections of the circulating water traveling screens and trash racks are in progress and will be continued as appropriate.

A task force has been established to investigate methods to prevent or mitigate biological impingement on the CWIP and Service Water traveling screens. This investigation will be completed and recommendations for any additional corrective actions will be completed by September 1, 1995.

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The Unit 1 RCIC system flow controller was adjusted prior to startup to ensure proper operation in the automatic mode. A root cause investigation of the RCIC system malfunction is in progress and will address long term corrective actions as needed.

SAFETY ASSESSMENT

This event has minimal safety significance in that the systems required to shutdown the plant responded as required. Although the RCIC system malfunctioned in the automatic mode, the system was capable of controlling level in the manual mode. Furthermore, additional level control systems did function properly to establish reactor water level during the event.

PREVIOUS SIMILAR EVENTS

A previous event involving a manual shutdown due to decreasing condenser vacuum and the loss of circulating water was reported in LER 1-86-026.

EIIS COMPONENT IDENTIFICATION

System/Component EIIS Code

Circulating Water System BS
Circulating Water Intake Pump BS/P
Circulating Water Traveling Screens BS/P/SCN
Primary Containment Isolation System JM
Reactor Core Isolation Cooling System BN
High Pressure Cooling Injection System BQ

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Unit 1 Sequence of Events
May 19, 1995

17:40 Received annunciator for high differential pressure on the 1C CWIP followed by high differential pressure annunciation on the 1D and 1B CWIs. Entered AOP-37, and reduced Reactor Power from 27.3 to 22%

17:44 CWIP 1C trip occurred due to traveling screen high differential pressure

CWIP 1D trip occurred due to traveling screen high differential pressure

17:46 CWIP 1B trip occurred due to traveling screen high differential pressure

17:49 Commenced Control Rod insertion (18-47) to reduce Reactor Power due to decreasing condenser vacuum

17:50 Condenser Shell Vacuum at 25.96"

17:50 Main Turbine Trip signal received due to low condenser vacuum trip.

17:52 1C CWIP start was attempted to maintain condenser vacuum

Condensate Discharge Header Temperature at 120.98 degrees F.

17:53 1C CWIP trip occurred due to traveling screen high differential pressure

17:53 1B CWIP start attempted

Condensate B-South Circulating Water Outlet Temperature at 152.75 degrees F.

17:54 1B CWIP trip occurred due to traveling screen high differential pressure

1D CWIP start attempted

17:55 1D CWIP trip occurred due to traveling screen high differential pressure

17:58 1D CWIP start attempted

17:59 1D CWIP trip occurred due to traveling screen high differential pressure

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18:00 1A CWIP start attempted

Condensate to Demineralizer/Filter Temperature at 150.03 degrees F.

18:01 1A CWIP trip occurred due to traveling screen high differential pressure

18:03 Condensate and feedwater pressures reduced to 20 psig due to apparent flashing in the hotwells.

18:04 1B CWIP start attempted

18:05 1C CWIP start attempted

18:05 1B CWIP trip occurred due to traveling screen high differential pressure

18:06 Reactor water level at 18211 (low level alarm setpoint)

1B CWIP start attempted

Manual Reactor Protection System trip Channel 'A' initiated due to decreasing condenser vacuum. Entered emergency shutdown procedure.

Manual Reactor Protection System trip Channel 'B' initiated due to decreasing condenser vacuum. All rods fully inserted.

Reactor Scram Channel 'B' trip due to Low Reactor Water

Reactor Scram Channel 'A' trip due to Low Reactor Water

Reactor Mode Switch to Shutdown

1C CWIP trip occurred due to traveling screen high differential pressure

RCIC being used for RPV level control until Condensate and Feedwater can be aligned. RCIC had to be placed to manual due to oscillations in the automatic mode.

1D CWIP start attempted

18:07 1C CWIP start attempted

1D CWIP trip occurred due to traveling screen high differential pressure

18:08 Reactor water level at 183.34" increasing

Reactor Feedpump 'A' and RCIC turbine trip occurred due reactor water level high trip (208 ").

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18:09 Closed steam line drains to maintain reactor pressure.

18:10 Placed 'A' loop Residual Heat Removal System in suppression pool cooling. The Condensate Startup Level Control Valve was placed in service. Reactor Recirculation Pumps at 10% speed.

18:14 Received groups 2, 6 and 8 due to level dropping to 140". Isolations were validated.

18:15 1B CWIP trip occurred due to traveling screen high differential pressure

18:19 1C CWIP trip occurred due to traveling screen high differential pressure

18:20 Scram Discharge Volume Level Ch A1, A2, B1 and B2 reset

18:21 Residual Heat Removal System 'B' Loop was placed in the suppression pool cooling mode anticipating closure of the Main Steam Isolation Valves

18:21 Reactor Scram Channel 'A' and 'B' Reset

18:30 Reactor Feedpump 'A' Trip Reset

18:37 The Main Steam Isolation Valves were closed to control vessel cooldown rate.

18:39 Condensate aligned to supply the reactor vessel via the Condensate Booster Pumps. Reactor Pressure at 410 psig

18:51 Emergency shutdown procedure was exited.

18:52 Reset group 2 and 6 isolations and placed Containment Atmospheric Control monitors and H2/O2 monitors in service.

19:09 Started the 1A and 1B Mechanical Vacuum Pumps.

19:20 Established pressure band of 350-425 psig and level band of 180 to 200"

May 20, 1995

11:36 Commenced Unit 1 reactor startup following the restoration of the circulating water system and tuning of the RCIC and HPCI flow control systems.

22:14 Unit 1 turbine generator synchronized to the off-site electrical grid system.

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Enclosure
List of Regulatory Commitments

The following table identifies those actions committed to by Carolina Power & Light Company in this document. Any other actions discussed in the submittal represent intended or planned actions by Carolina Power & Light Company. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Manager-Regulatory Affairs at the Brunswick Nuclear Plant of any questions regarding this document or any associated regulatory commitments.

Committed
Commitment date or
outage

A task force has been established to investigate 9/1/95 prevent or mitigate biological impingement on the CWIP and Service Water traveling screens and make recommendations for any additional corrective actions.

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CP&L

Carolina Power & Light Company
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JUN 09 1995

SERIAL: BSEP-95-0278

10 CFR 50.73

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

BRUNSWICK STEAM ELECTRIC PLANT UNIT 1
DOCKET NO. 50-325/LICENSE NO. DRP-71
LICENSEE EVENT REPORT 1-95-011

Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.73, Carolina Power & Light Company submits the enclosed Licensee Event Report. This report fulfills the requirement for a written report within thirty (30) days of a reportable occurrence and is submitted in accordance with the format set forth in NUREG-1022, September 1983.

Please refer any questions regarding this submittal to Mr. M. A. Turkal at (910) 457-3066.

Very truly yours,

J. Cowan, Director-Site Operations
Brunswick Nuclear Plant

SFT/

Enclosures

1. Licensee Event Report
2. Summary of Commitments

cc: Mr. S. D. Ebner, Regional Administrator, Region II
Mr. D. C. Trimble, NRR Project Manager - Brunswick Units 1 and 2
Mr. C. A. Patterson, Brunswick NRC Senior Resident Inspector
The Honorable H. Wells, Chairman - North Carolina Utilities Commission

*** END OF DOCUMENT ***
